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Research Grade-Evaluation Guide TS-70, 10/67

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NOTE

This document has been converted from the original paper format to electronic format without substantive change in series coverage or grading criteria. It was reviewed to correct errors that may have been introduced during the conversion process. In some standards minor corrections were made such as updating references to other documents that may have become obsolete, or correcting minor typographical errors in the original standard. Any errors that remain due to conversion to electronic format should be minor and are not intended to change the meaning of the original standard. If you find an error in any document on this CD, please send a FAX to HRCD - Perfection, 202-606-4891, or send a note to HRCD - Perfection, Office of Classification, U.S. Office of Personnel Management, 1900 E Street, NW, Washington, DC. The Internet e-mail address is fedclass@opm.gov. Identify the document, page, and error. Thank you for bringing any errors to our attention.

If you find page references near the right hand margin of this standard they indicate the pagination of the official, printed version of this standard. For example, a notation "PAGE 2, 4/88, TS-87" would mean that (1) page two of the printed version begins here, (2) the date of issuance was 4/88, and (3) the Transmittal Sheet number was TS-87.

Research Grade Evaluation Guide

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INTRODUCTION

This grade-evaluation guide is intended for use across series lines in determining grade levels of research positions. It supersedes the Guide for Evaluation of Positions in Basic and Applied Research issued in June 1960 and the Appendix-Frame of Reference Illustrations issued in August 1960. The basic concepts and structure of the 1960 guide are essentially unchanged. This revision is primarily for the purpose of refining and improving the earlier version to make it even more useful.

The guide is in two parts. Part I covers grades GS-11 through GS-15, using a point evaluation system embodying a person-in-job concept through which the qualifications, contributions, and professional standing of the incumbent are considered directly in the evaluation process. Part II provides criteria for grades GS-5 through GS-9, using a conventional narrative format. These criteria assist in defining lower limits of Degree A of the four factors for positions in Part I. Positions in grades above GS-15 are covered in the Guide for Appraisal of Scientific Positions Proposed for GS-16, GS-17, and GS-18.

SERIES DETERMINATIONS

This grade-evaluation guide is not intended to affect series classification. Positions classified to grade by means of this guide are to be placed in the most appropriate classification series in accordance with definitions published in the Commission's "Handbook of Occupational Groups and Series of Classes," and amplifying material in published classification standards.

The "person-in-job" concept applied to grade-level determinations in Part I of this guide is applicable to series determinations also. The qualifications of the incumbent are usually highly significant in selecting the most appropriate classification series for research positions.

TITLE DETERMINATIONS

The title structure in published position-classification standards typically varies in accordance with the nature of the occupation. For some series such as meteorology, forestry, and psychology, there are, for most positions, rather clear organizational, duty, and qualifications distinctions between research and other functions. The classification standards for such series prescribe separate research specializations with Research in the title for all research positions, including those not covered by Part I of this guide, e.g., supervisory, consultant and positions at levels below GS-11.

For other series such as physics, microbiology, geology, and mathematical statistics, there are generally no significant organizational, duty, and qualifications distinctions between research and

many nonresearch positions. Accordingly, research specializations have not been established in standards for such series.

In general, it is impracticable to arrive at a generalization concerning titles of research positions for all occupations covered by this guide. Ideally, it would be desirable to rely on the position-classification standard for the occupation in question. This was suggested in the tentative draft of the revision. However, many agencies indicated in their comments that (1) the title structure in the older standards does not reflect their current views based on experience with the Research Grade-Evaluation Guide, and (2) they prefer the use of the prefix "Research" in the titles of research positions.

In consideration of the foregoing and in order to avoid excessive title changes, we are authorizing continuation of the present titling practice for research positions, as follows:

When a research position is classifiable to a series for which a standard has been issued subsequent to June 1960 (the date of issuance of the original guide), the titling instructions in that standard will be used. For research positions in series for which there are no published standards or for which the standards were published prior to July 1960, agencies may continue to use the prefix "Research" in the position title. In any case, specified criteria for titling positions as "Supervisory" should be applied as appropriate.

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Part I -- Evaluation of Research Positions GS-11 Thru GS-15

COVERAGE

Part I of this guide is intended for use in the grade-level evaluation of positions engaged in basic or applied research in the biological, medical, agricultural, physical, or mathematical sciences, in engineering, or in psychology, when the positions involve either (1) the personal performance, as the highest level function and for a substantial portion of the time, of professionally responsible research; or (2) the direct and personal leadership of and participation in the activities of a research team or organizational unit when the primary basis of selection for the position is competence and capability in the performance of research rather than capability in supervising and managing a research organization.

Concepts

"Research," as the term is used above, is systematic, critical, intensive investigation directed toward development of new or fuller scientific knowledge of the subject studied. It may be with or without reference to a specific application. Such research includes, but is not limited to, theoretical and experimental investigations (1) to determine the nature, magnitude and inter-relationships of physical, biological, and psychological phenomena and processes; (2) to create or develop theoretical or experimental means of investigating such phenomena and processes; and (3) to develop principles, criteria, methods, and a body of data of general applicability for use by others.

The term "professionally responsible" is intended to set a lower limit to the level of positions covered by Part I of this guide. This floor, which translates to GS-11 in the classification grade structure, means that, as a minimum prerequisite to evaluation by means of Part I, positions must operate at the level of responsibility typically associated with the independent performance of research investigation.

The term "independent performance" is not intended to exclude supervisory assistance in the form of general guidance as to scope and objectives, or advice and consultation during the planning, execution or evaluation stages, provided the incumbent retains personal responsibility for actually planning and conducting the study, and for organizing, evaluating, and documenting the results. It also does not exclude critical review of the product in terms of the care and thoroughness with which the scientific method was followed, the relevance of conclusions to the data, possible omissions, etc. Specific direction as to the plan of attack, detailed definition of the problem before assignment to the incumbent, the taking over of analysis, inference, or reporting by others are limitations on independence.

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A member of a research team working on large problems which are not segmented into project assignments that can be conducted independently may be considered to meet this minimum criterion if (a) he fully participates as a professionally responsible member of the team in the substantive aspects of the work, and (b) he makes a contribution that may be regarded as equivalent to independent performance of limited but complete research project assignments.

In the research situation, team leadership, or supervision of a small unit, is commonly based on, and "carried" by, personal competence in research rather than by supervisory and administrative skill. Consequently, this guide provides for the classification of such supervisory positions by the same criteria as nonsupervisory research positions. On the other hand, some positions involving team leadership or supervision of a small unit, and nearly all positions involving direction of larger research organizations, require -- in addition to research competence -- marked supervisory and administrative ability. They are therefore to be classified, in part, by other criteria.

The crux of the distinction between the two situations, of course, lies in the actual operation of the positions rather than in the number of subordinates. A supervisory position for which research competence forms the primary basis for selection and evaluation should be classified under this guide as a "team leader"; a position for which supervisory or administrative abilities are the paramount considerations in the selection and evaluation process require the use of other standards. In some situations, it will be desirable to use both this guide and the Supervisory Grade-Evaluation Guide to appraise the grade level of the position.

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Related functions

In terms of characteristics of the work situation, research and development activities may be thought of as a spectrum from basic research, at one extreme, through applied research to development, test, and evaluation at the other extreme. The coverage of the guide is deliberately focused on the basic and applied research end of the spectrum.

This is not to imply that positions in basic and applied research are necessarily any more grade-worthy than positions in development, test and evaluation, or that the development, test and evaluation functions do not also call for a high degree of originality and inventiveness. Rather, the guide is focused on basic and applied research because of the differences in work situations, and the differences in language and criteria which are useful determining grade levels.

For example, it is least possible to define or measure basic research assignments, or the expectations in terms of results. For development, test and evaluation, the assignment frequently becomes a fairly definable thing and the desired results are known. Further differences extend even to the personal interests and characteristics of workers at the opposite ends of the spectrum.

There are, obviously, many positions in the "gray area" between the extremes, i.e., many positions which involve a combination of applied research and experimental development. The application of this guide to such positions must be a matter of judgment, based on determining whether there is sufficient involvement in research to render the guide applicable.

This guide is intended for use in the evaluation of positions which are essentially full-time research positions. It may also be used to appraise the research portion of mixed positions. However, in some cases, particularly where research and other functions are intertwined, it will be difficult to determine whether a position is as a whole a research position for which this guide is a suitable measuring instrument. To use this guide to evaluate such positions, all the following criteria should be satisfied:

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1. The position is predominantly characterized by systematic investigation of theory, experimentation, or simulation of experiments.

2. The work is characterized by research-type application of the scientific method including problem exploration and definition, planning of the approach and sequence of steps, execution of experiments or studies, interpretation of findings, and documentation or reporting of findings.
3. There is a clear requirement for the exercise of creativity and critical judgment, variation in which may materially affect the nature of the end product.
4. The qualifications, stature, and contributions of the incumbent have a direct and major impact on the level of difficulty and responsibility of the work performed.
5. Research capability as demonstrated by graduate education and/or research experience is a significant requirement in selection of candidates.

Exclusions

This guide is not intended for use in classifying positions involving the management coordination or administration of programs of research where such responsibilities represent the controlling or paramount features in the assignment; positions primarily responsible for monitoring research grants or contracts; positions of consultants who are not involved in the personal performance or participating leadership of research; positions involving the performance of limited elements of research work; positions involving primarily engineering development, test, and evaluation; positions involving primarily library-type research; positions involving research in such social sciences as history, geography, economics, and anthropology; positions limited to the conduct of field surveys to collect scientific data on natural phenomena such as the collection of meteorologic, hydrologic, oceanographic, geologic, or biologic data; or positions limited to collection and identification of entomological or other specimens for scientific collections.¹

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Obviously, some positions are not clear-cut. The conduct of field surveys for the purpose of collecting and reporting data, as such, is not within the narrow definition of research in this guide and is specifically excluded from coverage of this guide. However, some scientists engaged in such work may be making "theoretical and experimental investigations" and developing "principles, criteria, methods and a body of data of general applicability." The fact that the scientist uses research methods and interprets his findings in the light of established principles and hypotheses has little bearing on the

¹ The exclusion from the coverage of this guide of positions engaged in research administration and coordination, systems development and evaluation, research in social science, and other functions should not be construed as implying a lesser degree of concern for the impact of the incumbent on the dimensions of the position in such situations. It reflects rather a lack of fit of the specific criteria used in this guide

decision if the position does not satisfy the coverage criteria. The purpose of the work, as determined by responsible management, usually govern whether or not the position requires the conduct of substantial research of the type covered by this guide as an integral part of the work.

THE INTERACTION OF THE RESEARCH SITUATION AND THE RESEARCHER

The duties and responsibilities of a research position are especially dependent upon the interplay between the research situation or assignment (within an appropriate job environment) and the individual qualities of the incumbent. Creativity and originality are inherently of central importance in a research situation, because the purpose of research is to extend human knowledge and understanding. Yet, while the job situation may call for creativity and originality, the extent to which these qualities are actually brought into play is dependent in large part on the incumbent. Furthermore, while nonresearch situations are typically structured as to breadth (necessarily so, in order to fix responsibility and prevent functional overlapping) the research situation is typically expandable in breadth in accordance with the incumbent's capabilities. Hence, it is recognized that where the nature of the research situation involves a high potential for original and creative work, the work of the position may be performed at any one of several levels, depending in part upon the level at which the incumbent is capable of working and his motivation. This leads to what may be termed a "person-in-job" concept, based on the interaction of the assignment and the incumbent.

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This concept is not unlike the principle, long recognized in many nonresearch positions, that the qualifications of the incumbent may materially modify the position as actually performed. There are, however, two factors which make it particularly important and desirable to recognize this person-in-job concept in research positions. First, because of its "unlimited ceiling," and "expandable breadth," the research situation is much more likely to provide opportunity for full play of the incumbent's capabilities than the frequently more structured and limited nonresearch situation. In the second place, it is likely that in the nonresearch situation the incumbent's impact on the job will be reflected in the ways (such as additional duties or functions; greater authority for action; more difficult assignments where the difficulty of assignments can be predicted; less supervisory review, etc.) which are less subtle, and which can be identified and measured by more conventional means.

In recognition of the fact that the incumbent's personal qualifications do, in a research situation, have a profound impact on the dimensions of the job which results, this guide provides for considering both the research situation or assignment, and the qualifications of the scientist who occupies the situation or assignment. These factors together constitute the position actually being performed and form the basis for determining grade level.

CLASSIFICATION OF VACANT POSITIONS

The "person-in-job" concept expressed' above would seem to lead to difficulty in classifying vacant positions. This difficulty is, however, more apparent than real. A vacant position may be classified either (1) on the basis of a total factor pattern consonant with the qualifications to be required of any candidate selected for the position (then, obviously, the qualification requirements should not be compromised in the selection process without reconsidering the impact of such compromise on the classification); or (2) if a candidate has been tentatively selected, in consideration of the factor pattern appropriate to his qualifications. Then, obviously, the position evaluation must be reconsidered if the tentatively selected candidate is not finally appointed, and other candidates of different qualifications are considered.

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RELATIONSHIP TO GRADES OF SUPERVISORS

This guide is expressly designed to recognize the grade value of nonsupervisory performance which involves a very high degree of technical independence, a high degree of originality, and a high level of professional recognition and contribution. It is based on the thesis that while supervision is one ladder to high-level responsibility in scientific work, there is another ladder -- the ladder of personal creativity and scientific contribution. While a good supervisor can do much to create a favorable climate and to stimulate creativity and originality, in the final analysis, creativity and originality come from within the person who displays them.

Since these factors are personal to the incumbent, are subject to "supervision" to only a very limited degree, and are an alternate ladder to high-level work, it is not considered necessary that supervisors of research work always be in higher grades than any of their subordinates. In other words, it may be possible for the contribution of a highly creative nonsupervisory researcher to merit the same grade (for different reasons) as the contribution of the supervisor of the organization or unit. Nor is it considered that this situation can exist only where the supervision is purely administrative in nature. Technical supervision, including overall evaluation of results and guidance as to priorities of research to be undertaken, may be present without necessarily uniting the originality and creativity of subordinates.

Thus, positions graded under this's guide may, in some instances, be properly classified in the same grade as, or conceivably (albeit rarely), in a grade above that of the supervisor of the position. This can occur when the grade of the researcher is determined highly independent personal performance and his personal creativity, stature, and contributions.

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As indicated under "Coverage," many supervisory research positions may be classified under the team leadership criteria in this guide. Additional guidance in the evaluation of supervisory positions will be contained in the Supervisory Grade-Evaluation Guide, Part II, to be issued shortly.

FACTORS FOR EVALUATING RESEARCH POSITIONS

While the specifics of subject matter dealt with will vary according to the scientific or engineering field involved, grade levels of research positions have been found to depend on essentially the same elements, regardless of subject field. In this guide, these common elements have been grouped into the following four factors:

- I. The research situation, or assignment
- II. Supervision received
- III. Guidelines and originality
- IV. Qualifications and scientific contributions

Factor IV, Qualifications and Scientific Contributions, is double-weighted to reflect its importance and to offset what would otherwise be a disproportionate orientation toward the assignment and work situation in the other factors. It is recognized that there is considerable overlap between these factors. However, each is focused on a different aspect of the job-incumbent relationship. By considering and rating them separately, somewhat more precision and a greater degree of consistency can be obtained in the final evaluations than would be possible if a single overall evaluation were made.

The following notes relate to application of the factors:

Factor I, The research situation, or assignment

This factor deals with the nature, scope and characteristics of current studies being undertaken by the incumbent. The level credit for this factor should be based on a sufficient span of time to reflect the norm of current assignments rather than isolated and atypical projects. However, this factor is intended to reflect the situation or assignment in the current job, rather than a summation of the incumbent's assignments over a long period of time.

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In the case of a true team leader, i.e., one who is considerably more than a straw boss, a level should be credited which reflects the scope and character of projects being conducted by his team. In the case of a team member, the level should be based not on the total projects carried by the team, but upon the specific projects, or portion of the team load, carried by the incumbent.

It is the inherent difficulty and complexity of the research problem(s) which determine the level to be assigned for this factor, not the question of whether research is basic or applied.

For measurement purposes, the primary considerations in the research assignment are its scope and complexity, its objectives, the means of accomplishment, and the expected end results. The breadth of the problem and the depth or intensity of the required investigation are basic issues. The extent of related research studies, the extent to which objectives can be defined, the number of unknowns, the critical obstacles, and the variety and intensity of the knowledges which must be brought to bear for the solution of problems are also appropriate measures of relative difficulty and complexity.

In considering the expected end-product of research effort, the impact of the results on scientific theory and practice may be of significance. Also, important in consideration of the end-product are the extent and complexity of the validation processes required, the necessity for conversion of abstract concepts to hardware and/or to easily understood statements of theory, and the fruitfulness of the product in solving the initial situation and in opening new areas of investigation.

Factor II, Supervisory received

This factor deals with the supervisory guidance and control exercised over the position of the researcher, and also relates to the current job situation. Considerable care is required to evaluate this factor. In a research situation, a considerable amount of effective supervision may exist with only a minimum of formal supervisory contact. On the other hand, consultations with colleagues of higher, lower or equal standing in the organization are essential to maximum effectiveness of researchers at all levels, and should be distinguished from supervision.

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The effect of controls upon the positions may be measured by the incumbent's freedom for determination of course of action, and the degree of finality of his recommendations and decisions. Also to be considered are the manner in which he receives his assignments, the opportunity for procedural innovation, and the degree of acceptance of his final product.

Factor III, Guidelines and originality

This factor deals with the creative thinking, analyses, syntheses, evaluation, judgment, resourcefulness, and insight that characterize the work performed in the current job situation.

Guidelines usually consist of the literature in the field, procedures, and instructions; or precedent situations which may be adapted or modified to meet the requirements of the current situation. Points to be considered in relation to these guidelines are: (1) the extent and nature of the available written guides, (2) the intrinsic difficulty encountered in applying the guides in terms of their ready adaptability to the current situation, and (3) the degree of judgment required in their selection, interpretation, and adaptation.

In assessing the impact of creativity found in the position three considerations are important. The first consideration involves the requirement for original and independent creation, analysis, reasoning, evaluating, judging, and choosing between alternative methodologies. Also to be considered is the required interpretation of findings, translation of findings into a problem solution, and recording of these findings and interpretations in a form usable by others as well as in application to specific end-products. The third consideration is the impact of theories, principles, concepts, techniques, and approaches developed by the incumbent upon the scientific field of his research effort.

Factor IV, Qualifications and scientific contributions

This factor is not restricted to present and immediate past job performance. It is intended to focus on the total qualifications, professional standing and recognition and scientific contributions of the researcher, as these bear on the dimensions of the current research situation and work performance. Particular care must be observed to consider only those features of the factor which have a significant impact on the job.

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The degrees of Factor IV are expressed in part in terms of standing "and recognition in a specialized field. A researcher who is a recognized specialist in one field may be reassigned to a related field without change in degree of Factor IV, when it is expected by management that the researcher will probably perform at substantially the same level of competence after a reasonably short orientation period.

In evaluating this factor, consideration should be given to negative findings, which may be contributions to knowledge and guides to further research just as much as "positive" findings.

In some research situations, security regulations or other circumstances prevent publication of research results, and make it impossible to evaluate the work on the basis of its impact on the larger scientific community. In such cases, the work will have to be evaluated by means of the best possible judgment of its importance and the impact it would have if it could be published.

Undue emphasis should not be accorded mere number of publications; their quality and scientific significance, and especially the number of quality contributions, are more important.

Recency of accomplishment is important. Although the total history of accomplishment is considered, recent research or similar activity which assures maintenance of research competence is essential to full credit for past accomplishments.

Research positions of the type covered by this guide are characterized by a continuing personal struggle to keep abreast of rapidly advancing and changing disciplines. In resolving border-line

determinations of degrees of this factor, consideration should be given to whether the incumbent is engaged in current and vigorous professional development.

In evaluating the degree of Factor IV, Qualifications and Scientific Contributions, consideration may be given to the level of education completed. In general, research positions covered by this guide are of such nature that a bachelor's or higher degree is typically a requirement. (Some but not all qualification standards for research positions include such a requirement.) More-over, for some types of work, particularly basic theoretical research, graduate education is generally regarded as almost essential to the professional stature represented by the higher degree levels of Factor IV. On the other hand, a doctorate in and of itself would not warrant more than Degree A. However, a researcher with a Ph.D. whose graduate work demonstrated superior research ability (as defined in applicable qualification standards) may be assigned Degree B.

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EVALUATION SYSTEM

Each of the four primary factors which must be evaluated has a very wide degree range. To serve as key points for evaluating each factor as it applies to a particular position, three degrees -- A, C, and E -- with point values of 2, 6, and 10, respectively (4, 12, and 20 in the case of Factor IV) are defined in the degree definitions below. Definitions are not included for intermediate degrees B and D, point values 4 and 8, respectively (values 8 and 16, in Factor IV), because we have not been able to develop language precise enough to express these degrees without some overlapping of words. However, degrees B and D and their point values are an integral part of the plan, and are to be used when an element is determined to fall between the defined degrees.

Ordinarily, the use of point values between any two of the five degrees (e.g., 3 points for a degree of Factor I between A and 9 is not recommended. Under most circumstances, such refine distinctions in judgment cannot be reliably made, and efforts at too much refinement may only result in a false appearance of precision. However, the use of these values is not precluded under circumstances in which their use is supported by sound judgment.

The evaluation system involves a separate determination of the proper degree (A, B, C, D, or E) for each factor; assignment to each factor of the point value of the degree assigned; and conversion of the total point values to a GS-grade by means of the Grade-Determination Chart and accompanying instructions. If a position fails to measure up to degree A for a factor, it need not be assigned any points for that factor. (Failure to measure up to Degree A for Factors I or II would preclude use of Part I of this guide.)

The definition of Degree E for each of the four factors is followed by a definition titled "In Excess of Degree E." These definitions do not illustrate specific degrees, nor do they have assignable point

values, but rather are intended to provide additional guidance concerning the intent of Degree E. Thus, these "In Excess of Degree E" statements are useful elements of the guide for appraisal of positions in grades GS-15 and below. If, for one or more factors, a position exceeds Degree E (not necessarily to the extent shown by the "In Excess of Degree E" statement) additional points may be assigned by extrapolation.

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These "In Excess of Degree E" statements of the factors point up the absence of a GS-15 ceiling on researcher positions. Although these higher levels of the factors are not directly translatable in terms of specific grades above GS-15, they are useful as indicators of positions which support allocation above GS-16.

Evaluation systems of this type have been found to be useful aids to the formulation, recording, and consolidation of a series of judgments. The fact that subjective judgments are quantified should not be allowed to obscure the fact that they are judgments and that final decisions should rest on sound application of judgment rather than upon uncritical application of numbers. In applying a degree definition the definition as a whole, in its total context, must be applied -- not isolated words or phrases.

The interrelationship and interaction of the factors need to be considered carefully in assigning factor degrees. In general, the correlation of the factors (and good management practice) would tend to preclude more than a 2-degree difference between the factor degrees assigned to different factors. For example, the scope and complexity of the actual research situation (as distinguished from what it might be) need to be correlated with the ability and competence of the incumbent. Thus, if a researcher with Degree E qualifications were to undertake what is generally regarded as a typical Degree A assignment, his depth of insight and penetration and original approach could convert the routine Degree A assignment to a complex Degree C or higher assignment.

PROCEDURAL SUGGESTIONS FOR USE OF EVALUATION SYSTEM

The procedures for application of this guide are, of course, a matter for agency determination. The guide may be applied by procedures ranging from normal use by position classifiers (with adequate care and attention given to ascertaining from subject-matter specialists the degree of novelty and complexity of projects and the contributions and professional stature of the incumbent), to application by a panel with joint researcher-classifier membership.

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However, because statistical evidence indicates that more reliable results may be expected if panels are used, the use of panels is recommended². Since some of the judgments called for by the guide can

² For detailed information concerning the analysis and the results obtained, see "A Rating Scale Method for Evaluating Research Positions," by H. Alan McKean, John Mandel and Mary N.

best be made by researchers, with their fund of relevant technical knowledge, and since joint participation on the panel affords an excellent opportunity for close cooperation and the merging of the contributions which can be made by professional personnel and by classifiers, joint researcher-classifier membership on panels is recommended.

If panels are used, we suggest that they include a reasonable diversity of disciplines to assure a better perspective with respect to the relationship of the specific position to broader areas of research. (The limited statistical evidence available indicates that panel members in other disciplines than that of the position being rated can rate accurately if the facts regarding the position are clear.)

Where panels meet as a group, and reach an understanding as to job facts before they undertake to evaluate the job, results seem to be more consistent than where a dossier concerning the job is passed around and each attempts to rate the job without prior discussion. However, care needs to be exercised to confine discussions prior to rating to facts, and to avoid prejudicing the individual ratings by premature expressions of conclusions. The individual raters should rate independently. Because of the importance of subjective judgments of knowledgeable scientists and engineers in the evaluation process, the classification record should identify the scientists and engineers who provided the appraisals, individually or as members of panels.

Some agencies that have reported successful use of evaluation panels in the use of the guide have limited the use of panels to positions at GS-13 and above in order to reduce the workload on key professional personnel. Other organizations report that collateral values derived from the use of evaluation panels warrant the additional effort and cost of using the panel method at lower grades, as well.

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Information regarding achievements, publications, appearance before professional organizations, reviews of the researcher's work, etc., will need to be developed when the position is reviewed. This may be presented in a variety of ways -- for instance, by the supervisor to the panel -- but it also needs to be incorporated in a brief summary of the more important background elements which can be appended to the position description. Information concerning the incumbent will need to be redeveloped or modified with changes in incumbency or the competence and stature of the incumbent.

Research positions are particularly susceptible of changes in performance which may occur gradually over a period of time. This makes it particularly important that they be periodically reviewed to determine what changes may have occurred. Many research installations have promotion panels make periodic reviews of the qualifications and professional development of their researchers, with a view to recommending promotions for those regarded as qualifying for a higher grade. Although the role

Steele, in July- August, 1960 issue of Personnel Administration.

of such panels may vary, they commonly evaluate the knowledges, abilities, personal qualities, achievements, and contributions of the candidates as these relate to the requirements of the position to be filled. Such appraisals of the person-job relationship for purposes of selecting candidates for promotion require knowledge and judgment similar to that required for grade-level evaluation. Accordingly, agencies may find it helpful to use a single panel for promotion, position classification, employee development, and other purposes.

This guide requires coordination and makes possible a meaningful integration of the qualifications review and the classification review. It provides a ground on which the job knowledge, and knowledge of the incumbent's performance and capabilities, which are possessed by the technical staff of the organization, can be intelligently related to classification and qualification standards and the other personnel and management processes. Such coordination and management participation should do much to provide a basis for more effective personnel management, in a broad sense, with regard to research positions.

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A number of agencies have reported values in application of guide which extend well beyond its use as a classification instrument. This guide has been viewed as a major tool in improving the public image of the Government service. Recruiters for research organizations have effectively used the guide in informing prospective candidates of the modern personnel management practices in research administration in the Federal service and of the opportunities to advance to the highest levels as an individual researcher without supervisory responsibility.

GRADE-DETERMINATION CHART

Total point value assigned to the four factors may be converted to grade in accordance with the chart below.

CONVERSION SCALE	
Classification grade	Total of factor point values
GS-11	8-12
GS-12	16-22
GS-13	26-32
GS-14	36-42
GS-15	46-52

Where the points assigned to a position fall in the gap between ranges assigned to GS-grades, the position may be considered to be "borderline." Thus, it should be assigned to either the higher or lower of the two grades between which it falls in accordance with a judgment determination based on aspects of the position which may not have been fully considered in arriving at the point values, and in consideration of best alignment with other properly classified positions.

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DEGREE DEFINITIONS³**Factor I: The research situation, or assignment****Degree A (2 points)**

Projects consist of scientific investigations of limited scope, with readily definable objectives, which require only fairly conventional techniques. Such investigations may stand alone as studies of specific phenomena or problems, or they may be segments in a structure of related investigations. In either case, the specific assignment typically requires the incumbent to perform or to participate responsibly in all phases of the complete research process including problem definition, planning, execution, analysis, interpretation, and reporting of findings.

Projects may be studies in new areas, where the objectives are clear-cut and fairly conventional means can be used; they may involve applying existing theory or methods to new classes of subjects, or to classes of subjects previously experimented with, under various controlled changes in conditions; or they may involve reruns or adaptations of previous studies in the light of changes in theory, improvements in techniques and

Degree C (6 points)

The incumbent is responsible for formulating and conducting a systematic research attack on a problem area of considerable scope and complexity. The scope of the problem area is typically such that it must be approached through a series of complete and conceptually related research studies. These may be carried out personally by the incumbent, or by a team of which the incumbent is the leader. In terms of complexity, problems are typically difficult to define; require unconventional or novel approaches; require sophisticated research technique; and/or present other features of more than average difficulty.

Characteristically, research studies of this scope will result in a series of publishable contributions to knowledge which will: (a) answer important questions in the scientific field, account for previously unexplained phenomena, and/or open significant new avenues for further study; (b) represent an important

³ Substantive changes in degree definitions as compared to the 1960 version of this guide are marked by asterisks.

<p>Degree E (10 points)</p> <p>At this level, the research situation consists of:</p> <p>(1) Responsibility, ordinarily as a team leader, for formulating and guiding a research attack on problems in applied research which have been recognized as critical obstacles to progress or development in areas of exceptional interest. The solution of such problems would represent a major advance, opening the way for extensive related development; or</p> <p>(2) Responsibility for attacking basic research problems which have been recognized as exceptionally difficult and unyielding to research analysis so that their solution would represent an advance of great significance. While it is not possible to stipulate "success" in the solution of such problems, for the research situation to be evaluated at this level a reasonable expectation of fruitful work on problems of such difficulty and magnitude is presupposed. In any case, a significant rate of progress is expected; or</p> <p>(3) * Responsibility as a team leader for attacking problems of such scope and complexity as to require subdivision into separate phases of which several are characteristic of Degree D. (Positions of this type necessarily involve substantial supervisory responsibility.) *</p>	<p>* In Excess of Degree E</p> <p>The research situation is characterized by:</p> <p>(1) Responsibility as a team leader for formulating and guiding a broadscale attack on problems in frontier areas of critical importance to major national programs. The project is of such complexity and scope that It must be subdivided into a number of separate experimental and theoretical research phases, several of which are typical of Degree E of this factor; or</p> <p>(2) Responsibility for attacking basic research problems of such fundamental interest, extraordinary difficulty, and resistance to attack that (a) there have been numerous attempts by highly competent scientists to explore the area and to gain a fundamental understanding of the processes or phenomena; (b) new hypotheses, concepts, and techniques must be developed for attack, and interpretation; and (c) the successful performance of the work will lead to the major modification or important extension of current theory. In either (1) or (2) above, the assignment and leadership exercised influence the shaping of agency program goals, advancement of programs and understanding in the total field, and the planned activities of numerous scientists in Government, academic institutions, and private industry. *</p>
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Factor II: Supervision received

<p>Degree A (2 points)</p> <p>Most typically, the specific problem is assigned by his supervisor with general instructions as to scope and objectives of the study. The study may, however, be suggested by the incumbent, and undertaken after supervisory approval. The incumbent confers with his supervisor regarding definition of the problem, its relationship to broader research goals of the activity, and the development of a plan of attack. The direction and guidance thus received are aids to the incumbent in the critical problem definition and planning stages, but do not remove his personal professional responsibility for the completeness and adequacy of these steps. From this point, incumbent is expected to take responsibility for the study and pursue it to completion, solving problems ordinarily entailed in accomplishment of the work with only occasional reference to the supervisor. Decisions that materially change the nature of the work (e.g., decisions to discontinue work, change emphasis, or change plan of attack) originate elsewhere or are approved by the supervisor. Incumbent interprets results of own work, and prepares reports and papers which are reviewed for inclusion of necessary supporting information, completeness, clarity, and results. Work is reviewed for adequacy of method, for completeness and for results.</p>	<p>Degree C (6 points)</p> <p>In programed or applied research, the researcher is typically assigned a broad problem area; in basic research he may not be given an "assignment," but may work with substantial freedom within an area of primary interest. In either event, he is allowed substantial freedom in identifying, defining and selecting specific problems for study, being responsible for determining what appear to be the most fruitful investigations and approaches to the problem area.</p> <p>The researcher is responsible, with little or no supervisory assistance, for formulating hypotheses, for developing and carrying out the plan of attack, for coping with novel and difficult problems requiring *modification of standard* methods, for analyzing and interpreting results, and for preparing comprehensive reports of findings.</p> <p>The supervisor is kept informed, through occasional discussions, of general plans and progress of the work. The supervisor approves plans which call for considerable investments of time or equipment; and is responsible for final decisions concerning direction of work, and concerning changes in or discontinuance of important lines of investigation, particularly if they involve abandonment of what had been thought to be promising lines of investigation or of a substantial</p>
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	<p>Degree C (Continued)</p> <p>relied on to such an extent that his recommendations are ordinarily followed. The supervisor attempts to create a climate conducive to the generation of ideas through staff discussions, seminars, etc. The researcher has full responsibility for decisions regarding use of equipment and other resources made available to him. His completed work and reports are reviewed principally to evaluate overall results.</p>
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<p>Degree E (10 points)</p> <p>Technical supervision is nominal * and consultative in nature. * The researcher works under broad administrative supervision, which is * generally limited to approval of staffing, funds, and facilities, * and broad agency policies. * Within the framework of management objectives, priorities, and pressures for results, the researcher is expected to locate and explore the most fruitful areas of research in relation to the agency's program and needs and the state of the science involved; to take complete responsibility for formulating research plans and hypotheses and for carrying them through to completion; and to take full technical responsibility for interpreting findings, including interpreting their applicability to activities and interests of the agency, and their broader applicability to basic scientific methodology. Within the agency, these interpretations are accepted as technically authoritative, and become the basis for necessary administrative action. They are, of course, subject to further test and ultimate validation or modification by the scientific community *and management decisions on the use of the results of research.*</p>	<p>* In Excess of Degree E</p> <p>The supervision received is characterized by: (1) a degree of confidence in and reliance on the researcher's productivity, competence, and judgment such that there is an unusual level of support of his recommendations and his most novel and as yet seemingly fruitless investigations; (2) responsibility such that interpretations, recommendations and conclusions having major impact on matters of great urgency and significance are furnished other agencies and the professional community without reference to or knowledge of higher authority in the agency, and (3) a supervisory relationship that fully reflects recognition of the researcher as both (a) a top technical authority in his field in the agency and (b) a distinguished and brilliant scientist. *</p>
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<p>Factor III: Guidelines and originality</p> <p>Degree A (2 points)</p> <p>Existing theory and methods are generally applicable to most, though not necessarily all, parts of the problem. Available material may contain some inconsistencies, may be partially unconfirmed, and/or may suggest several different possibilities of dealing with the problem at hand. The originality required of an incumbent at this degree is primarily the development of a complete and adequate research design for his specific problem, based on use of sound professional judgment in selecting and adapting from available possible methods and techniques those best suited to the immediate problem. This may involve the application of highly complex (but established) experimental techniques, or some modification of details of technique or method. This degree involves only a limited amount of innovation or modification of procedures and techniques.</p>	<p>Degree C (6 points)</p> <p>In basic research, available guides and precedents, e.g., existing literature in the field, are limited in usefulness (are contradictory, contain critical gaps, are only partially related to the problem) or may be largely lacking because of the novel character of the work being done. A high degree of originality is required in defining problems which are very elusive and/or highly complex, in developing productive hypotheses for testing, in identifying significant problems for study in developing important new approaches, methods, and techniques, and in interpreting and relating the significance of results to other research findings.</p> <p>In applied research this degree typically involves development and application of new techniques and original methods of attack to the solution of important problems presenting unprecedented or novel aspects. This includes application of a high degree of insight to isolate and define the critical features of the problems; and application of a high degree of originality and ingenuity in adapting, extending, and synthesizing existing theory, principles and techniques into original and non-obvious combinations or configurations, and in defining and conducting the specific research studies necessary for the solution of the problems dealt with.</p> <p>Page 26, 6/64, TS-52</p>
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<p>Degree E (10 points)</p> <p>This degree of originality is represented by: (1) Creative extension, of existing theory or methodology, or significant contribution to the development of new theory or methodology which is of such scope as to supplant or add new dimensions to a previous framework of theory or methodology (for example, the new theory may represent a higher abstraction which includes relevant prior knowledge, at least as special cases of the new and which accounts for phenomena which may have been inconsistent with prior theory); or</p> <p>(2) Responsibility (particularly in applied research, for applying a very high degree of imagination and creativity in the solution of problems of * marked * importance (for example, to the scientific field, to national defense, to health, to major segments of the national economy, etc.), for which there is an almost complete absence of applicable guidelines, pertinent literature, and methodology.</p>	<p>In Excess of Degree E</p> <p>The work is characterized by the application of such unusual productivity, creativity, and depth of insight into the fundamental nature of phenomena and their relationships as to produce a substantial variety of new methods and techniques, of new approaches to formerly intractable problems, of identification of new problems to be attacked, and of important new concepts and discoveries, inclusive of the type described in Degree E of this factor. New areas are opened up for exploration, the findings have widespread applicability to other fields of science and technology, and there is likely to be a major stimulus to scientific and technological effort and achievement in the field of endeavor.*</p>
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Factor IV: Qualifications and scientific contributions**Degree A (4 points)**

The researcher typically ** performs independent research, or serves as a full member of a research team. He has demonstrated, through satisfactory planning and execution of one or a few research studies, ability to define his problems clearly, to perform the necessary background research, to develop an appropriate plan of attack, to execute the research plan, to organize and evaluate the results, and to prepare acceptable reports of findings, with some guidance as to objectives and occasional consultations during the progress of his study. Work may be expected to result (or has resulted) in co-authorship, in a secondary role, of one or more major papers or reports of considerable interest to the scientific field, or in primary authorship of one or more minor papers or reports which will serve (or have served) chiefly to fill narrow blanks in an existing framework of knowledge, or corroborate existing theory, or to report findings of limited scope.

The researcher serves as a source of information on his own research projects, principally to researchers within his own laboratory * or sphere of investigation, and on related or similar projects elsewhere. *

Degree C (12 points)

At this degree, the researcher has demonstrated his ability as a mature, competent and productive worker.** He will typically have authored one or more publications of considerable interest and value to his field (as evidenced by favorable reviews, by citation in the work of others, by presentations of papers to professional societies, etc.), and/or he will have contributed inventions, new designs or techniques which are of material significance in the solution of important applied problems. His contribution involves leadership of a productive research team, or, leadership in the conception and formulation of productive research ideas (as evidenced by the fact that his ideas have been the basis for productive studies by others, within or outside his immediate organization), and/or highly productive (in terms of both quantity and quality) personal performance of research of such originality, soundness, and value as to have marked him as a significant contributor to his professional field. He is beginning to be sought out for consultation by colleagues who are, themselves, professionally mature researchers. Further evidence of his emerging recognition may be selection to serve in important committee assignments of professional groups. He is qualified to speak and deal responsibly concerning technical matters in his area of immediate

Degree C (Continued) researchers within and outside his own organization.	
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<p>Degree E (20 points)</p> <p>At this degree, the researcher has demonstrated outstanding attainment in a broad, or in a narrow but intensely specialized field of research. He will typically have authored a number of important publications, of which at least some have had a major impact on advancing the field, or are accepted as definitive of important areas of it, and/or he will have contributed inventions, new designs or techniques which are regarded as major advances in basic or applied research, and which have opened the way for extensive further developments, or have solved problems of great importance to the scientific field, to the agency, or to the public.</p> <p>Contributions at this degree are of such importance and magnitude that they serve to move the art forward to the extent that other researchers must take note of the advance in order to keep abreast of development in the field. He is sought as a consultant by colleagues who are, themselves, ** specialists in his field; he speaks authoritatively regarding his field in contacts within and outside the Government. Invitations to address * national * professional organizations, and recognition in the literature of his field through favorable reviews and numerous citations by others are further typical evidences of attainment. * For purposes of comparison with private employment, the level of attainment contemplated at</p>	<p>* In Excess of Degree E</p> <p>The incumbent is a nationally recognized authority and leader in an area of widespread scientific interest and investigation. He will typically have received honors and awards from major national organizations for his accomplishments. He is sought as an advisor and consultant on scientific and technological programs and problems which extend well beyond his own field. His reputation as a scientific leader is such that he serves as a recruiting attraction for recent graduates who seek opportunities to work under his inspiration and guidance in order to catch some of his imaginative fire, critical judgment, and research technique.* His personal competence is likely to be a major consideration in agency sponsorship of programs in his field.</p>
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Part II -- Evaluation of Research Positions Below GS-11

This material is for wide application, across the same occupational lines covered by Part I of the Guide. Positions covered in Part II are typically trainee or research assistant positions or involve the independent performance of limited research assignments.

CHARACTERISTICS OF GS-5 POSITIONS

Positions at this level are characterized by intensive training and the performance of supporting work in research requiring professional training but little or no experience.

Assignments are planned to (1) provide experience and training to orient employees to administrative policies and regulations, technical programs, research techniques, and operating procedures; (2) ascertain interests and aptitudes as a basis for more responsible assignments; and (3) contribute to the productive output of the research unit to which assigned.

Trainees at GSA receive detailed instruction and guidance. Work is reviewed in detail for correctness of methods employed, proper application of basic scientific principles and accuracy of results. Phases Of work not covered by instructions or guidelines are referred

CHARACTERISTICS OF GS-7 POSITION

Positions at this level are characterized by advanced training in research techniques and methods and by the performance of work of limited scope and complexity, involving a variety of assignments which are accomplished by established methods, procedures and techniques and are minor phases of broader assignments of other employees. Assignments are typically selected to develop the employee for work of a higher level.

Assignments are accompanied by instructions as to the problem to be studied, the extent to which studies are to be carried, the approach desired and the general techniques to be applied. The supervisor spot checks work in progress and provides instructions or guidance on difficulties encountered during the performance of the work. GS-7 employees apply independently standard or specified research methods, tests, techniques, and procedures and develop simple work plans and preliminary conclusions which they present orally or in preliminary draft form for approval or revision. Unanticipated conditions are typically referred to the supervisor for guidance. The work is reviewed for technical adequacy and thoroughness of application of methods and techniques.

Judgment and some initiative are applied in planning simple details of the work as in deciding how to collect and present data; in determining from established guide material, the methods and

techniques to use; in making simple adaptations of methods and techniques; and in recognizing circumstances requiring special attention.

CHARACTERISTICS OF GS-9 POSITIONS

Research studies carried out by employees at this level may be complex but are characterized by clear and specified objectives, investigation of a limited number of variables and self-directed work in planning and carrying out experiments in accordance with approaches which have been structured by others. GS-9 researchers generally plan project details on the basis of precedents established in related projects, and devise and recommend alternative methods of standardized analysis as a basis for solving moderately difficult problems. Generally, they have a higher degree of responsibility for factfinding than for fact interpretation.

Work is performed under the technical and administrative supervision of a researcher of higher grade. Immediate objectives are indicated by the supervisor, as well as the nature of results to be expected. Potential and actual sources of difficulty are discussed with supervisor. Supervisor reviews recommended work plans, and inspects work to observe adequacy of research methods and practices and to give advice during the progress of the work. Completed reports are reviewed from the standpoint of adequacy, completeness, and validity of conclusions reached.

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In general, precedents are available in the form of previous studies on related subjects, standard methods in textbooks, handbooks, or other literature, and, possibly, from manuals of procedure. Most assignments, however, have features which require other than the direct application of these guides so that incumbents at this level must select and adapt methods and piece together the best techniques applicable to the problem.

Judgment is required in insuring that tests, measurements and observations are made under conditions reflecting scientific and operating requirements and will yield valid results. Originality is evidenced in developing improvements and modifications to established procedures.

FOOTNOTES

/2/ This document is identified as a "guide" rather than a "standard" because it provides grade-evaluation criteria for positions in many occupations, rather than describing specific classes of positions in one occupation. However, it has the same force and effect as a standard and is issued under the authority of Section 401 of the Classification Act of 1949, as amended.